# THE PANCRONOMETER,
OR UNIVERSAL GEORGIAN CALENDAR;

ADJUSTED TO THE
GREGORIAN and JULIAN Accounts.

SHEWING THE
DAY of the YEAR, MONTH and WEEK,

WITH THE
Fixt and moveable Feaſts and Feſtivals, and Terms for any Time paſt, preſent, and future, and Explanations and Directions.

PART I. Inſcribed to his MAJESTY.

ALSO THE
Fundamental Hypotheſes, Reaſons and Uſes of this Calendar.

PART II. Inſcribed to the Earl of CHESTERFIELD.

AND
The Reaſons, Rules, and Uſes of OCTAVE *Computation, or Natural Arithmetic.*

PART III. Inſcribed to the Earl of MACCLESFIELD.

By H. J. k

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THE

PANCRONOMETER,

OR THE

GEORGIAN Univerſal CALENDAR.

Adapted to all Sorts of

COMPUTATIONS of TIME.

Moſt humbly inſcrib'd to

His moſt GRACIOUS MAJESTY

King GEORGE the SECOND.

1st GEORGIAN MONTH.
ST. PETER.

Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	1 ♑	e	21 Dec.	a	10 Dec.
M	2	2	f	22	b	11
Tu	3	3	g	23	c	12
W	4	4	a	24	d	13
Th	5	5	b	25	e	14
F	6	6	c	26	f	15
Sa	7	7	d	27	g	16
Su	8	8	e	28	a	17
M	9	9	f	29	b	18
Tu	10	10	g	30	c	19
W	11	11	a	31	d	20
Th	12	12	a	1 Jan.	e	21
F	13	13	b	2	f	22
Sa	14	14	c	3	g	23
Su	15	15	d	4	a	24
M	16	16	e	5	b	25
Tu	17	17	f	6	c	26
W	18	18	g	7	d	27
Th	19	19	a	8	e	28
F	20	20	b	9	f	29
Sa	21	21	c	10	g	30
Su	22	22	d	11	a	31
M	23	23	e	12	a	1 Jan.
Tu	24	24	f	13	b	2
W	25	25	g	14	c	3
Th	26	26	a	15	d	4
F	27	27	b	16	e	5
Sa	28	28	c	17	f	6

2d GEORGIAN MONTH.
ST. ANDREW.

Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	29	d	18 Jan.	g	7 Jan.
M	2	30	e	19	a	8
Tu	3	31 ♒	f	20	b	9
W	4	32	g	21	c	10
Th	5	33	a	22	d	11
F	6	34	b	23	e	12
Sa	7	35	c	24	f	13
Su	8	36	d	25	g	14
M	9	37	e	26	a	15
Tu	10	38	f	27	b	16
W	11	39	g	28	c	17
Th	12	40	a	29	d	18
F	13	41	b	30	e	19
Sa	14	42	c	31	f	20
Su	15	43	d	1 Feb.	g	21
M	16	44	e	2	a	22
Tu	17	45	f	3	b	23
W	18	46	g	4	c	24
Th	19	47	a	5	d	25
F	20	48	b	6	e	26
Sa	21	49	c	7	f	27
Su	22	50	d	8	g	28
M	23	51	e	9	a	29
Tu	24	52	f	10	b	30
W	25	53	g	11	c	31
Th	26	54	a	12	d	1 Feb.
F	27	55	b	13	e	2
Sa	28	56	c	14	f	3

3d GEORGIAN MONTH.
ST. JAMES.

Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	57	d	15 Feb.	g	4 Feb.
M	2	58	e	16	a	5
Tu	3	59	f	17	b	6
W	4	60	g	18	c	7
Th	5	61 ♓	a	19	d	8
F	6	62	b	20	e	9
Sa	7	63	c	21	f	10
Su	8	64	d	22	g	11
M	9	65	e	23	a	12
Tu	10	66	f	24	b	13
W	11	67	g	25	c	14
Th	12	68	a	26	d	15
F	13	69	b	27	e	16
Sa	14	70	c	28 29	f	17
Su	15	71	d	1 Mar.	g	18
M	16	72	e	2	a	19
Tu	17	73	f	3	b	20
W	18	74	g	4	c	21
Th	19	75	a	5	d	22
F	20	76	b	6	e	23
Sa	21	77	c	7	f	24
Su	22	78	d	8	g	25
M	23	79	e	9	a	26
Tu	24	80	f	10	b	27
W	25	81	g	11	c	28 29
Th	26	82	a	12	d	1 Mar.
F	27	83	b	13	e	2
Sa	28	84	c	14	f	3

4th GEORGIAN MONTH.
ST. JOHN.

Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	85	d	15 Mar.	g	4 Mar.
M	2	86	e	16	a	5
Tu	3	87	f	17	b	6
W	4	88	g	18	c	7
Th	5	89	a	19	d	8
F	6	90 ♈	b	20	e	9
Sa	7	91	c	21 : 14	f	10
Su	8	92	d	22 : 3	g	11
M	9	93	e	23	a	12
Tu	10	94	f	24 : 11	b	13
W	11	95	g	25	c	14
Th	12	96	a	26 : 19	d	15
F	13	97	b	27 : 8	e	16
Sa	14	98	c	28	f	17
Su	15	99	d	29 : 16	g	18
M	16	100	e	30 : 5	a	19
Tu	17	101	f	31	b	20
W	18	102	g	1 Ap. 13	c	21
Th	19	103	a	2 : 2	d	22
F	20	104	b	3	e	23
Sa	21	105	c	4 : 10	f	24
Su	22	106	d	5	g	25
M	23	107	e	6 : 18	a	26
Tu	24	108	f	7 : 7	b	27
W	25	109	g	8	c	28
Th	26	110	a	9 : 15	d	29
F	27	111	b	10 : 4	e	30
Sa	28	112	c	11	f	31

5th GEORGIAN MONTH. ST. PHILIP.							6th GEORGIAN MONTH. ST. BARTHOLOMEW.						
Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.	Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	113	d	12Ap.12	g	1 Apr.	Su	1	141	d	10 May	g	29 Apr.
M	2	114	e	13 : 1	a	2	M	2	142	e	11	a	30
Tu	3	115	f	14	b	3	Tu	3	143	f	12	b	1 May
W	4	116	g	15 : 9	c	4	W	4	144	g	13	c	2
Th	5	117	a	16	d	5	Th	5	145	a	14	d	3
F	6	118	b	17 : 17	e	6	F	6	146	b	15	e	4
Sa	7	119	c	18 : 6	f	7	Sa	7	147	c	16	f	5
Su	8	120	d	19	g	8	Su	8	148	d	17	g	6
M	9	121 ♉	e	20	a	9	M	9	149	e	18	a	7
Tu	10	122	f	21	b	10	Tu	10	150	f	19	b	8
W	11	123	g	22	c	11	W	11	151	g	20	c	9
Th	12	124	a	23	d	12	Th	12	152 ♊	a	21	d	10
F	13	125	b	24	e	13	F	13	153	b	22	e	11
Sa	14	126	c	25	f	14	Sa	14	154	c	23	f	12
Su	15	127	d	26	g	15	Su	15	155	d	24	g	13
M	16	128	e	27	a	16	M	16	156	e	25	a	14
Tu	17	129	f	28	b	17	Tu	17	157	f	26	b	15
W	18	130	g	29	c	18	W	18	158	g	27	c	16
Th	19	131	a	30	d	19	Th	19	159	a	28	d	17
F	20	132	b	1 May	e	20	F	20	160	b	29	e	18
Sa	21	133	c	2	f	21	Sa	21	161	c	30	f	19
Su	22	134	d	3	g	22	Su	22	162	d	31	g	20
M	23	135	e	4	a	23	M	23	163	e	1 June	a	21
Tu	24	136	f	5	b	24	Tu	24	164	f	2	b	22
W	25	137	g	6	c	25	W	25	165	g	3	c	23
Th	26	138	a	7	d	26	Th	26	166	a	4	d	24
F	27	139	b	8	e	27	F	27	167	b	5	e	25
Sa	28	140	c	9	f	28	Sa	28	168	c	6	f	26

7th Georgian Month. St. Thomas.							8th Georgian Month. St. Matthew.						
Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.	Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	169	d	7 June	g	27 May	Su	1	197	d	5 July	g	24 June
M	2	170	e	8	a	28	M	2	198	e	6	a	25
Tu	3	171	f	9	b	29	Tu	3	199	f	7	b	26
W	4	172	g	10	c	30	W	4	200	g	8	c	27
Th	5	173	a	11	d	31	Th	5	201	a	9	d	28
F	6	174	b	12	e	1 June	F	6	202	b	10	e	29
Sa	7	175	c	13	f	2	Sa	7	203	c	11	f	30
Su	8	176	d	14	g	3	Su	8	204	d	12	g	1 July
M	9	177	e	15	a	4	M	9	205	e	13	a	2
Tu	10	178	f	16	b	5	Tu	10	206	f	14	b	3
W	11	179	g	17	c	6	W	11	207	g	15	c	4
Th	12	180	a	18	d	7	Th	12	208	a	16	d	5
F	13	181	b	19	e	8	F	13	209	b	17	e	6
Sa	14	182	c	20	f	9	Sa	14	210	c	18	f	7
Su	15	183 ♋	d	21	g	10	Su	15	211	d	19	g	8
M	16	184	e	22	a	11	M	16	212	e	20	a	9
Tu	17	185	f	23	b	12	Tu	17	213	f	21	b	10
W	18	186	g	24	c	13	W	18	214	g	22	c	11
Th	19	187	a	25	d	14	Th	19	215 ♌	a	23	d	12
F	20	188	b	26	e	15	F	20	216	b	24	e	13
Sa	21	189	c	27	f	16	Sa	21	217	c	25	f	14
Su	22	190	d	28	g	17	Su	22	218	d	26	g	15
M	23	191	e	29	a	18	M	23	219	e	27	a	16
Tu	24	192	f	30	b	19	Tu	24	220	f	28	b	17
W	25	193	g	1 July	c	20	W	25	221	g	29	c	18
Th	26	194	a	2	d	21	Th	26	222	a	30	d	19
F	27	195	b	3	e	22	F	27	223	b	31	e	20
Sa	28	196	c	4	f	23	Sa	28	224	c	1 Aug.	f	21

9th GEORGIAN MONTH.

ST. JAMES the Leſs.

Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	225	d	2 Aug.	g	22 July
M	2	226	e	3	a	23
Tu	3	227	f	4	b	24
W	4	228	g	5	c	25
Th	5	229	a	6	d	26
F	6	230	b	7	e	27
Sa	7	231	c	8	f	28
Su	8	232	d	9	g	29
M	9	233	e	10	a	30
Tu	10	234	f	11	b	31
W	11	235	g	12	c	1 Aug.
Th	12	236	a	13	d	2
F	13	237	b	14	e	3
Sa	14	238	c	15	f	4
Su	15	239	d	16	g	5
M	16	240	e	17	a	6
Tu	17	241	f	18	b	7
W	18	242	g	19	c	8
Th	19	243	a	20	d	9
F	20	244	b	21	e	10
Sa	21	245	c	22	f	11
Su	22	246	d	23	g	12
M	23	247	e	24	a	13
Tu	24	248	f	25	b	14
W	25	249	g	26	c	15
Th	26	250	a	27	d	16
F	27	251	b	28	e	17
Sa	28	252	c	29	f	18

10th GEORGIAN MONTH.

ST. JUDE.

Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	253	d	30 Aug.	g	19 Aug.
M	2	254	e	31	a	20
Tu	3	255	f	1 Sept.	b	21
W	4	256	g	2	c	22
Th	5	257	a	3	d	23
F	6	258	b	4	e	24
Sa	7	259	c	5	f	25
Su	8	260	d	6	g	26
M	9	261	e	7	a	27
Tu	10	262	f	8	b	28
W	11	263	g	9	c	29
Th	12	264	a	10	d	30
F	13	265	b	11	e	31
Sa	14	266	c	12	f	1 Sept.
Su	15	267	d	13	g	2
M	16	268	e	14	a	3
Tu	17	269	f	15	b	4
W	18	270	g	16	c	5
Th	19	271	a	17	d	6
F	20	272	b	18	e	7
Sa	21	273	c	19	f	8
Su	22	274	d	20	g	9
M	23	275	e	21	a	10
Tu	24	276	f	22	b	11
W	25	277 ♎	g	23	c	12
Th	26	278	a	24	d	13
F	27	279	b	25	e	14
Sa	28	280	c	26	f	15

11th GEORGIAN MONTH. ST. SIMON.							12th GEORGIAN MONTH. ST. MATTHIAS.						
Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.	Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	281	d	27 Sept.	g	16 Sept.	Su	1	309	d	25 Oct.	g	14 Oct.
M	2	282	e	28	a	17	M	2	310	e	26	a	15
Tu	3	283	f	29	b	18	Tu	3	311	f	27	b	16
W	4	284	g	30	c	19	W	4	312	g	28	c	17
Th	5	285	a	1 Oct.	d	20	Th	5	313	a	29	d	18
F	6	286	b	2	e	21	F	6	314	b	30	e	19
Sa	7	287	c	3	f	22	Sa	7	315	c	31	f	20
Su	8	288	d	4	g	23	Su	8	316	d	1 Nov.	g	21
M	9	289	e	5	a	24	M	9	317	e	2	a	22
Tu	10	290	f	6	b	25	Tu	10	318	f	3	b	23
W	11	291	g	7	c	26	W	11	319	g	4	c	24
Th	12	292	a	8	d	27	Th	12	320	a	5	d	25
F	13	293	b	9	e	28	F	13	321	b	6	e	26
Sa	14	294	c	10	f	29	Sa	14	322	c	7	f	27
Su	15	295	d	11	g	30	Su	15	323	d	8	g	28
M	16	296	e	12	a	1 Oct.	M	16	324	e	9	a	29
Tu	17	297	f	13	b	2	Tu	17	325	f	10	b	30
W	18	298	g	14	c	3	W	18	326	g	11	c	31
Th	19	299	a	15	d	4	Th	19	327	a	12	d	1 Nov.
F	20	300	b	16	e	5	F	20	328	b	13	e	2
Sa	21	301	c	17	f	6	Sa	21	329	c	14	f	3
Su	22	302	d	18	g	7	Su	22	330	d	15	g	4
M	23	303	e	19	a	8	M	23	331	e	16	a	5
Tu	24	304	f	20	b	9	Tu	24	332	f	17	b	6
W	25	305	g	21	c	10	W	25	333	g	18	c	7
Th	26	306	a	22	d	11	Th	26	334	a	19	d	8
F	27	307 ♏	b	23	e	12	F	27	335	b	20	e	9
Sa	28	308	c	24	f	13	Sa	28	336	c	21	f	10

13th GEORGIAN MONTH.

ST. PAUL.

Week Days.	Month Days.	Solar Days.	Septimate.	New Stile.	Septimate.	Old Stile.
Su	1	337 ♐	d	22 Nov.	g	11 Nov.
M	2	338	e	23	a	12
Tu	3	339	f	24	b	13
W	4	340	g	25	c	14
Th	5	341	a	26	d	15
F	6	342	b	27	e	16
Sa	7	343	c	28	f	17
Su	8	344	d	29	g	18
M	9	345	e	30	a	19
Tu	10	346	f	1 Dec.	b	20
W	11	347	g	2	c	21
Th	12	348	a	3	d	22
F	13	349	b	4	e	23
Sa	14	350	c	5	f	24
Su	15	351	d	6	g	25
M	16	352	e	7	a	26
Tu	17	353	f	8	b	27
W	18	354	g	9	c	28
Th	19	355	a	10	d	29
F	20	356	b	11	e	30
Sa	21	357	c	12	f	1 Dec.
Su	22	358	d	13	g	2
M	23	359	e	14	a	3
Tu	24	360	f	15	b	4
W	25	361	g	16	c	5
Th	26	362	a	17	d	6
F	27	363	b	18	e	7
Sa	28	364	c	19	f	8
		365* 366†	d	20	g	9

EXPLANATION of the GEORGIAN KALENDAR.

The Georgian ÆRA commences with the Sun (at his return in the 1ſt of ♑) on Sunday the 10th of December A. D. 1755, Old Stile, and revolves with it for the ſpace of 10219 years, *viz.* till A. D. 11974, when only a ſingle nucthemeron (or 24 hours) is to be allowed for adjuſting a new period.

Eaſter, &c. may be fixed to ſtated days. The Georgian Year is divided into 13 Months, each containing 28 Days, or 4 Weeks, beſides the 365th Day, conſecrated to the commemoration of the birth of our bleſſed Saviour, and the 366th, appropriated for a day of thankſgiving and feſtivity in the Britiſh dominions every leap or fourth year, except every 33d leap, or 132d year.

Each Month has its Apoſtle. The 1ſt and 2d Columns in the Georgian Kalendar (containing the Week-days and Days of the Georgian Months) being the ſame in each Month, prevent the preſent abſurd confuſion, by confining the Week days to the ſame reſpective Solar and Month days in every year, the 3d column ſhewing the ſynchronal Days of the Sun's diſtance from the 1ſt of ♑.

N.B. This Kalendar and the following Tables and Directions may be contracted, ſo as to be contained on one ſide of a Sheet of Royal Paper.

* This day is ſequeſter'd (as it were) out of the year, and called CHRISTMAS, in memory of the Nativity.

† This day every 4th or leap year (except every 132d year) is the Britiſh Luſtrum, and called BRITONS-DAY.

A Table of Centuriates in the uppermoſt Squares, and of Annates in the reſt.

Biſſeptimates to be uſed in leap years till	6.15.16.25 34.43.44.53 62.71.72 81	7.8.17.26 35.36.45.54 63.64.73 82	0.9.18.27 28.37.46.55 56.65.74 83.84	1.10.19.20 29.38.47.48 57.66.75.76 85	2.11.12.21 30.39.40.49 58.67.68.77 86	3.4.13.22 31.32.41.50 59.60.69.78 87	5.14.23.24 33.42.51.52 61.70.79.80	Common Septimates
e	L 2.13.19.24	L 3 8 14.25	L 9.15.20.26	L 4.10.21.27	L 5.11.16.22	L 6.17.23.0	L 1.7.12.18	d
d	L 3.8.14.25	L 9.15 20.26	L 4.10.21.27	L 5.11.16.22	L 6.17.23.0	L 1.7.12.18	L 2.13.19.24	c
c	L 9.15.20.26	L 4.10.21.27	L 5.11.16.22	L 6.17.23.0	L 1.7.12.18	L 2.13.19.24	L 3.8.14.25	b
b	L 4.10.21.27	L 5.11.16.22	L 6.17.23.0	L 1.7.12.18	L 2.13.19.24	L 3.8.14.25	L 9.15.20.26	a
a	L 5.11.16.22	L 6.17.23.0	L 1.7.12.18	L 2.13.19.24	L 3.8.14.25	L 9.15.20.26	L 4.10.21.27	g
g	L 6.17.23.0	L 1.7.12.18	L 2.13.19.24	L 3.8.14.25	L 9.15.20.26	L 4.10.21.27	L 5.11.16.22	f
f	L 1.7.12.18	L 2.13.19.24	L 3.8.14.25	L 9.15.20.26	L 4.10.21.27	L 5.11.16 22	L 6.17.23 0	e
March.					Perpetual Julian Annates.			

A Table of ſtated Days.

Circumciſion, Jan. 1.
Epiphany, Jan. 6.
Hillary Term, Jan. 23.—Feb. 12.
St Paul, Jan. 25.
King Charles's Martyrdom, Jan. 30.
Purification, Feb. 2.
St Matthias, Feb. 24.
St David, Mar. 1.
Lady Day, Mar. 25.
St George, April 23.
St Mark, April 25.

St Philip and James, May 1.
Reſtoration, May 29.
St Barnabas, June 11.
St John Baptiſt, June 24.
St Peter, June 29.
St James, July 25.
St Bartholomew, Aug. 24.
St Matthew, Sept. 21.
St Michael, Sept. 29.
St Luke, Oct. 18.

Michaelmas Term, Oct. 23.—Nov. 28.
St Simon and Jude, Oct. 28.
All Saints, Nov. 1.
Powder Plot, Nov. 5.
St Andrew, Nov. 30.
St Thomas, Dec. 21.
Nativity, Dec. 25.
St Stephen, Dec. 26.
St John Evangeliſt, Dec. 27.
Innocents, Dec. 28.

A Table of Gregorian Paſchates in the undermoſt Line, and of Julian Paſchates in the uppermoſt, with the Days of Eaſter in the middle.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	0
Mar. 29	Ap. 19	Ap. 5	Mar. 29	Ap. 12	Ap 5	Ap. 19	Ap. 12	Mar. 29	Ap. 19	Ap 5	Mar. 29	Ap. 19	Ap. 5	Mar. 22	Ap. 12	Ap. 5	Ap 19	Ap. 12
Mar. 28	Ap. 18	Ap. 4	Mar. 28	Ap. 11	Ap. 4	Ap. 25	Ap. 11	Mar. 28	Ap. 18	Ap. 11	Mar. 28	Ap. 18	Ap. 4	Mar. 28	Ap. 11	Ap. 4	Ap. 18	Ap. 11
Mar. 27	Ap. 17	Ap. 3	Mar. 27	Ap. 17	Ap. 3	Ap. 24	Ap. 10	Ap. 3	Ap. 17	Ap. 10	Mar. 27	Ap. 17	Ap 3	Mar. 27	Ap. 10	Ap. 3	Ap. 24	Ap. 10
Mar. 26	Ap. 16	Ap. 9	Mar. 26	Ap. 16	Ap. 2	Ap. 23	Ap. 9	Ap. 2	Ap. 16	Ap. 9	Mar. 26	Ap. 16	Ap. 2	Mar. 26	Ap. 16	Ap. 2	Ap. 23	Ap. 9
Ap. 1	Ap. 15	Ap. 8	Mar. 25	Ap. 15	Ap. 1	Ap. 22	Ap. 8	Ap. 1	Ap. 22	Ap. 8	Mar 25	Ap. 15	Ap. 8	Mar. 25	Ap. 15	Ap. 1	Ap. 22	Ap. 8
Mar. 31	Ap 14	Ap. 7	Mar. 24	Ap. 14	Mar. 31	Ap. 21	Ap. 14	Mar. 31	Ap. 21	Ap. 7	Mar. 31	Ap. 14	Ap. 7	Mar. 24	Ap. 14	Mar. 31	Ap 21	Ap. 7
Mar. 30	Ap. 20	Ap. 6	Mar. 23	Ap. 13	Ap. 6	Ap. 20	Ap. 13	Mar. 30	Ap. 20	Ap. 6	Mar. 30	Ap. 13	Ap. 6	Mar. 23	Ap. 13	Mar. 30	Ap. 20	Ap. 6
18	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

DIRECTIONS.

All the centuriate columns belong to the new ſtile, and only that noted [perpetual Julian annates] belongs to the old ſtile. The centuriate number is the firſt figure of the year till A. D. 1000, and the two firſt figures, of that and all ſucceeding years, only obſerve that the centuriate till A. D. 100 is 0. — The remainder of any year divided by $\left.\begin{matrix}28\\19\end{matrix}\right\}$ is the $\left\{\begin{matrix}\text{Annate}\\\text{Paſchate}\end{matrix}\right\}$ for that year.

Thus, 17 is the annate and 5 the paſchate for A. D. 1753, and 18 and 6 for 1754, and 19 and 7 for 1755, and ſo on in regular revolutions; ſo that the numbers for one year being found, thoſe for the following years are known.

To find Eaſter. In the column of the centuriate find the annate number, and in the line of the annate under the paſchate of the year for old ſtile, but above the paſchate for new ſtile, ſtands the day and month that Eaſter falls on that year.

Examples. In the new ſtile. For A. D. 1753, 1754, and all years following till A. D. 1800, the ſecond centuriate column is to be uſed, becauſe their two firſt figures [17] ſtand therein in the uppermoſt ſquare.

For the old ſtile. The fifth or perpetual column is always to be uſed. The annates for 1753, 1754, being 17, 18, and the paſchates being 5, 6, direct to Ap. 22, and Ap. 14, for the Eaſters thoſe years, new ſtile; and to Ap. 11, and Ap. 3, old ſtile. Thus may Eaſter be readily found for any year, paſt, preſent, or future; only 'tis to be noted, that by reaſon of ſome defects in the Gregorian or new ſtile, an allowance of a week muſt be made in a few Gregorian Eaſters about 150 years hence, &c. which may eaſily be diſtinguiſhed by a ſhort note and directions when the elapſed time may require it. In the line of the annate (before the days of Eaſter) ſtands the ſeptimate, or letter denoting the Sundays of the year in the Kalendar, ſo that the Sundays of the year being thereby known, the other week days are known by ſeptimate letters in their order; for if a ſtands for Sundays, b then denotes the Mondays, c the Tueſdays, &c.

But it is to be noted that when the annate is 0.4.8.12.16.20.24. (noted in the table with L for leap year) then the ſeptimate letter at the beginning of the line of the annate denotes the Sundays from the firſt of January to the laſt of February, and the ſeptimate letter in the middle of the annate line is the Sunday letter for the remainder of ſuch leap year. *N. B.* the laſt year of each Gregorian century (except each 4th, commencing at A. D. 1600) is not a leap year: ſo that at every no-leap century the ſtiles widen a day more; therefore, at A. D. 1800, the difference, which is now 11 days, will become 12.

Examples of the uſe of the ſeptimates.—For 1753. In the middle of the annate line [17] ſtands g for new ſtile, and c for old ſtile, ſo that the days of the months in the Kalendar that ſtand by g are the Sundays in the columns of the former ſtile, and thoſe by c are the Sundays in the latter: and the other letters ſhew the other week days in their natural order in both. In like manner the Sunday

day ſeptimates for 1754 are found to be f O. S. and b N. S. And e and a for 1755. But 1756 (whoſe annate is 20) being leap year has d for the Sunday ſeptimate till the 1ſt of March, and c afterwards to the end of the year for new ſtile; and g and f for O. S. But the year 1800 being a no-leap in the new ſtile, has but one ſeptimate letter, viz. e. In like manner A. D. 1900 has but g yet A. D. 2000 being a Gregorian leap, has b and a. —*N. B.* To the ſolar numbers of Mar. 1ſt, in each ſtile (71 and 82) in leap years one muſt be added, ſo as to account them 72 and 83: the ſame muſt be done for every month-day to the ſolar end of ſuch years.

To find the dependents on Eaſter. From the ſolar number in the line of Eaſter-day in the Kalendar ſubtract 63 (but in leap years only 62) for the ſolar that ſhews Septuageſſima in either ſtile: thus, for 1753, from 123 (the Eaſter ſolar of the year in both ſtiles, being in the line of Ap. 22 and Ap. 11, the days of Eaſter) the remainder 60 ſtands with Feb. 18 for Septuageſſima new ſtile, and Feb. 7 old ſtile; the next Sunday is 6 a and the next 5 a; the Wedneſday following 5 a is the firſt day of Lent, and the Friday before Eaſter is good Friday.

To the ſolar of Eaſter [123] add 17 for the ſolar number of Eaſter term [140] at May 9, N. S. and Ap. 28, O. S. 18 added to that gives 158 for Rogation Sunday, May 27, N. S. and May 16, O. S. (the Thurſday following being Aſcenſion day) and 14 added to Rogation ſolar makes 172 the ſolar of Whitſunday at June 10, N. S. and at May 30, O. S. the Sunday following, being Trinity Sunday, and 12 added to the Whitſun-ſolar makes 184 at June 22 for Trinity term N. S. and June 11, O. S. Advent is the neareſt Sunday to Nov. 30.

The ſolar numbers ſhew how far any month-day is advanced in the ſolar year, and are uſeful in computations and calculations of various ſorts, as wages, intereſt, &c. &c. The columns of new and old ſtile in the Kalendar ſhew on what day in one ſtile any day of the other ſtile falls; for though the old ſtile is now aboliſhed, yet it is neceſſary to be ſtill regarded on ſeveral occaſions in reſpect of paſt and preſent time. The characters of the ſigns ſhew the ſynchronal days of the ſun's entrance into them, and his place, &c. &c. might be added.

H. J.

THE FUNDAMENTAL HYPOTHESES, REASONS, AND USES OF THE GEORGIAN KALENDAR:

Moſt reſpectfully inſcribed to

The Rt Hon. Earl of CHESTERFIELD.

By H. J.

Hypotheſes, Reaſons, and Uſes of the GEORGIAN KALENDAR.

IT may be rationally preſumed, that the omnipotent creator of the univerſe at firſt made every *ſpecies* of beings perfect in their kinds, and gave each regular and uniform order, motion, number, weight, and meaſure, according to the various ends for which he deſtinated them in perpetuating the ſymmetry of the whole, in the manner, and for the ſeveral periods he deſigned each of them. For God is not the author of confuſion, but of order: *he made a place for the ſilver and gold*; *he made the weight for the winds, and weighed the waters by meaſure, and ſet bounds that they may not paſs*; *he made a decree for the rain, and a way for the lightening of the thunder*; *he ordained bounds for the ſea*; *he appointed the moon for ſeaſons, and the ſun knoweth his going down.*

This being granted, is it not rational to ſuppoſe; that the original apparent motions of the ſun, moon, &c. were each perfect, ſo as to compleat their periods in conſtant times reſpectively coincident with one another, like the harmonious vibrations of muſical chords?

On this ſuppoſition, thus founded, it may be demanded, what number of revolutions the ſun and moon made in their original ſynodical courſes?

The very learned and indefatigable Mr *Whiſton* has pitched upon 360 days for the ſun's primitive journey through his annual orbit; but that, being a number of mere human choice for its aptneſs on geometrical and aſtronomical occaſions, perhaps is not ſo agreeable to fact as the number 364, which coincides with the divine fundamental diviſion of time into days (evenings and mornings) weeks of 7 days, ſeaſons or months, and years. For 7 days × 52 weeks = 364 days, compleat a year without a fraction; and the ſame does 13 ſeaſons of months, ſuppoſing the moon originally compleated her lunation in 28 days, or 4 weeks.

But then it may be aſked, how happened the additional time of almoſt 30 hours, which we now find in the annual courſe of the ſun, and almoſt of 37 hours in the lunations?

May not theſe additions be thus accounted for? There has lately been diſcovered a prodigious ring encompaſſing the planet *Saturn*, at a great diſtance from his body; which aſſuredly God has ſuſpended there to anſwer ſome great ends of his providence: and might not there have been originally a ſimilar *annulus* encompaſſing our globe in a certain orbit between it and the moon? for *ab eſſe ad poſſe certiſſime valet conſequentia.*

We find even *now* vaſt cavities in the bowels of the earth; and might not there have been abundantly more ſuch, and larger at firſt, filled only with condenſed vapours? Might not theſe vapours, fermented into inflammation,

mation, and expanded by rarefaction at the grand period of the deluge (when the *Antediluvians* had filled up the meaſure of their iniquities, ripe for God's vengeance) by their elaſtic preſſure on the ſubterraneous waters, force them upon the ſurface, when the fountains of the great deep were thus broken up? And, at the ſame time, might not the ſurrounding ring, attracted by the nearer approach of theſe waters of the abyſs (no longer in *æquilibrio* between the moon and earth) be poured down with the waters of the atmoſphere, to compleat the deluge, the cataracts or windows of heaven being thus opened?

When the waters which were above the firmament accumulated with the waters of the firmament, or atmoſphere, and thoſe under the firmament, in the ſea, and profound abyſs, all contributed to elevate the tumultuous fluid above the higheſt mountains.

In the mean time the earth ſhook and trembled, and all her foundations were out of joint; ſubterraneous eructations diſtorting her *ſtrata* in all directions, and exchanging ſurface for core, and mountains for vallies, and *vice verſâ*; by univerſal earthquakes, volcanos and convulſions: during which travail, the vapours, before ſhut up in her womb, burſting forth, allowed not only room for the waters of the abyſs at length to retreat to the ſituation from whence they had been diſlodged, but alſo receptacles for the ætherial waters of the *annulus* (fallen to the earth) to ſubſide into.

This hypotheſis may, perhaps, be as rational, as thoſe of certain *theoriſts*; ſince it provides ſufficient waters, and alſo *reſervoirs* for draining the waters of the deluge into; for want of which they have been greatly embarraſſed: but if it be diſſonant from fact, yet being propoſed only as a ſubject of ſpeculative enquiry, and not as poſitive matter of fact; if thereby ſeveral *phænomena* may be well accounted for, it may perhaps be admitted; ſince even falſe ſchemes, can illuſtrate many true appearances: for tho', either the *Ptolemaic* or *Pythagoric* ſyſtem muſt be erroneous, (being contradictory to one another) yet all the planetary motions, &c. are accounted for, and truly calculated by either: and Dr *Halley*'s uſeful ſyſtem of the magnetic revolution is founded but on conjecture.

Though God effects his ſpiritual works of mercy in man's redemption *ſupernaturally*; yet, is not the omnipotent God of nature able to accompliſh his providential operations of goodneſs and judgment, by making *natural cauſes* the inſtruments of his will?

Therefore, ſince it cannot be demonſtrated, that there was really no original *annulus* (for a negative cannot be proved here); if the ſuppoſition, that there was one, does not appear ridiculous, it is ſufficient for the end for which it is here intended.

Now, beſides the main purpoſes for which this hypotheſis is adduced, it may elucidate obſcurities concerning the covenant, which God eſtabliſhed with *Noah*, that he would not deſtroy mankind any more by waters, and that there ſhould be no more a flood to deſtroy the earth: for, ſince the flood, the elaſtic vapours being for the moſt part diſcharged into the atmoſphere, from the bowels of the earth, they can never again, by natural cauſes, raiſe up the ſubterraneous waters to cover the face of the earth: neither is there any aqueous ring above our atmoſphere now remaining, by its fall to elevate the ocean above the bounds that are ordained for it.

Before the flood, we may well ſuppoſe there was a perpetual ſpring; which ſeems confirm'd by the vigorous longevity of the *Antediluvians,* whoſe conſtitutions could hardly have endured ſo long, had they been expoſed to the ſhocks of changes of weather and ſeaſons: and had there been variety of theſe, *Adam* and *Eve* muſt have had cloathing, beſides what their ſhame made them invent to cover their nakedneſs. And notwithſtanding the *Antediluvians* drank only water, and eat only the fruits of the earth (for *Noah,* who firſt planted a vineyard, had the firſt permiſſion to eat fleſh) yet the variety of weather (had there been any) would have ſhortened their days ſooner than the *ſlow poiſon* of the forbidden fruit brought on their gradual death. And though the ſun mov'd in the æquinoctial, yet its direct rays might be blunted and diverged, by the intervening broad and deep *annulus,* which occaſioned a conſtant, ſerene, pure air, moſt fit for vegetation and breathing: But at the *Diluvian cataſtrophe,* the vapours aſcending from the abyſs, in conjunction with the contents of the *annulus* (the *Pandora*'s boxes) the *pabulum* of ſubſequent malignities from thence diffuſed; and hence our atmoſphere might become replete with thoſe groſs meteors, with which it ſtill abounds: and from thence might proceed the crops of weeds, briars, and thorns, (denounced in the curſe of the earth's barrenneſs, and man's labour for his diſobedience) inſtead of the primitive, almoſt voluntary fertility only of plants, fruits, &c. for food, or delight, &c. the ſurface being altered, and the ſeeds or *ſtamina* of exotic vegetables, and the ſperm of innumerable *ſpecies* of pernicious animalcules, &c. being corrupted, conveyed, and diſperſed at the deluge, from the waters above the firmament, and from the waters below the firmament, to the ſuperficies of this terraqueous globe; many of whoſe animals and vegetables (as well as its ſoil) might alſo, by the tranſplantation and ſoaking of the deluge, be likewiſe degenerated and tranſmuted.

May not the refractions which form the *rainbow* proceed from vapours and clouds, thus occaſioned by additional meteors in our atmoſphere?

Thus, the rainbow might never have appeared before the flood; but ſince that *æra*, it is in the cloud for a monumental token, covenant, or ſignal remembrancer, that the waters above the firmament being removed into the bowels of the earth, they can no more become a flood to deſtroy all fleſh.

But though God and reaſon too (if this hypotheſis be admitted) thus aſſure us, that there is no farther danger to be apprehended from another univerſal deluge, yet we are aſcertained by God, that he will at length deſtroy *all* by fire; a few conſiderations of which final commutation, perhaps, may not be eſteem'd impertinent, though it be a digreſſion, indeed, from the principal ſcope of this paper.

It is evident, that the earth and air, with the electrical ætherial fire, in conjunction with the ſolar rays, can ſupply ſufficient combuſtibles and treaſures of heat for that purpoſe. 'Tis well known that there are immenſe quantities of combuſtible ſubſtances under ground, inflammable even by culinary fire, yea, ſelf-burning, as is evident in mount *Ætna*, *Veſuvius*, *Hecla*, and numberleſs other *Volcanoes*; and the force of the ſolar rays (eſpecially when collected in *focuſes*) is almoſt incredible, and 'tis now diſcover'd (particularly by the *Philadelphian* experiments of the ingenious Mr *Franklin*) that the *electrical fire* has effects prodigiouſly ſurprizing, as has the fulminating force of the atmoſphere.

With the united force of all theſe may God come at the day of judgment, when the *Lord Jeſus* ſhall be revealed from Heaven with Angels of his power, in flaming fire.

When the atmoſphere, earth, water, and all their appurtenances ſhall then vaniſh in univerſal flaſhes, and be reduced into their primitive *chaos* and light, of which they were at firſt formed. When (ſince God annihilates nothing that he has created, for it was all good) the fumes of the conflagration may be attracted to the *Moon*, *Mars*, *Venus*, or ſome other planet; which may, perhaps, be *embryoes*

bryoes of future worlds, to be ſtock'd with new *ſpecies* of animals, ſuitable to their reſpective qualities and ſituations, in the immenſe expanſes of time and ſpace.

All terreſtial ſubſtances and beings ſhall then diſappear, except the *human ſtamina*, and *human ſouls:* the *ſtamina* of the bodies of *mankind*, made in the image, ſimilitude, and likeneſs of God himſelf; and the *ſouls of men*, living ſouls into which God breath'd the breath of immortal life: *theſe*, and theſe *only*, at the general conflagration of this ſublunary ſyſtem (when all things elſe ſhall be tranſmuted and melt awây) ſhall alone remain the *ſame* unperiſhable *individuals:* for the ſeveral *ſtamina* being attracted and reunited to their reſpective *ſouls*, and together aſſayed by the laſt judicial fire, the *pure* ſhall revive invigorated and rarified for a new ſtate of *glory*; and the *impure* ſhall revive again indeed, but debaſed and cruſh'd into a new ſtate of *miſery*, according to the ſeveral qualities (good or bad) they had imbibed in life, from religion and virtue, or from irreligion and vice, the impreſſions whereof will ſtill remain to be expanded. After which, the *former* may aſcend in infinite time and ſpace, by an *aſymptotic* approach nearer to the divine eſſence and happineſs, without ever poſſibly arriving at conſummate perfection; whilſt the *latter* may deſcend, ingulph'd in a ſimilar approximation, towards miſery.

Thus the covenant of the rainbow may be a token, that God will not deſtroy the world by *water*, but by *fire*; for now the aqueous ring being removed, can no more contribute to effect a deluge; of which truth, the *bow* is a ſure token; for had not the ring been removed, and the refracting meteors (ſome conveyed down, and others aſcended from the bowels of the earth, as by this *hypotheſis*) the *bow* could not have appeared in the clouds, which before the flood were not exiſting with the refracting quality we now find they have.

But to return to the main Point: one great effect which this extraneous body of ſupra-firmamental waters muſt have at its fall upon our globe, muſt have been a retardation of the earth's motion, by the ſhock and additional gravity; ſo that the annual courſe, which is here ſuppoſed to have been 364 days, before the percuſſion, being impeded, required afterwards the ſpace of 365, 25 — for a revolution in the ſame orbit.

Another effect of the fall of the *annulus* might be the obliquity of the ecliptick: for, whereas originally our globe moſt probably revolv'd in the æquinoctial, theſe adventitious waters being ſwallowed up by more and greater caverns towards one pole than the other, might remove the earth's center of gravity out of the center of the ſphere; ſo that the ſummer might become longer, and the winter ſhorter, in the Northern, than in the Southern hemiſphere; and thereby (the annual courſe being impreſſed with an elliptic, inſtead of its priſtine circular figure) the retroceſſion of the equinoxes might be produced; and by the weight, ſuch a bias might have been given to the *æquilibrium* of the terreſtrial *axis*, as to occaſion the angle of inclination of about 23° 30′, between the diurnal and annual directions; which produces the variety of ſeaſons, and different lengths of our days and nights, in their preſent fluctuation.

The evening and morning are ſuppoſed always and every where equal to each other (ſo as to biſect each *nucthemeron*, or day and night) from the commencement of the creation till the deluge: but ſince that period, the days and nights are become unequal at different ſeaſons, and in the ſame places, (except at the æquinoxes) and alſo in different latitudes at the ſame ſeaſons, &c. tho' the *annual* aggregates of the nocturnal and diurnal hours are nearly equal in any and every place on this globe; for every part has (nearly) the ſun for one half of the year *above*, and the other half *below* the horizon: but yet the exceſſive heat in ſome places, and cold in others, and the violence of each at oppoſite ſeaſons, in the ſame places and climates, occaſion many vaſt countries to lie deſolate; and others to become almoſt intollerable, both to their human and brute inhabitants. So that as in every country we have viſible demonſtrations of the deluge, in the *ſtrata* of ſtones, minerals, ſhells, &c. under ground; likewiſe our year, days, nights, and ſeaſons, declare the judgments of God, and the firmament ſheweth his vengeance.

For further, another conſequence of the removal of the *annulus* may be the aberration of the planets (from their original uniform courſe) near to the plane of the *ecliptick*, by a perturbation of the regularity of their orbits and motions in their elliptical, inſtead of circular revolutions. For 'tis well known what influence the acceſs or receſs of the planets have upon one another.

But ſuppoſing the terreſtrial *annulus* inſufficient to effect all this by its fall; yet might not ſimilar mutations in ſome one or other of the planets (beſides the earth) have contributed to the preſent irregularities of the celeſtial *phænomena*? And may not more alterations be expected, whenever it may pleaſe the almighty governor of the univerſe to remove the *Saturnian annulus*?

That different ſituations have different effects on the planets is evident in the moon's influence at her different diſtances from the earth in her *aphelion*, *perihelion*, and quadratures.

Now, ſuppoſing the moon's original lunation conſiſted of 28 days, or 4 weeks; then 13 of theſe lunations preciſely coincide with the ſuppoſed original year of 364 days, or 52 weeks: but by the receſs of the matter of the *annulus* to a greater diſtance from her, the attraction (which we ſee by the tides is great between her and ſaline aqueous bodies) being reciprocally diminiſhed, the chain, which, before (as it were) tied her to the earth, was ſtretch'd by a defect in the middle; ſo that her tangent-direction carried her (in an *evolute*) to her preſent orb, where deſcribing figures of longer *radii*, ſhe requires now 29,5 + days to compleat her courſe, which with the ſame velocity ſhe before perform'd in 28 days.

Indeed in the uniform motion of all the planets in the ſame plane there muſt be more eclipſes than at preſent; but then, whereas they are ſuppoſed all regular at their reſpective ſtated times; inſtead of implying a defect in the architecture of the heavens, they would be beautiful ornaments, and uſeful *indices* of times and ſeaſons, and afford infallible ready means for finding the longitude, and other helps in aſtronomy and geography, difficult *now*, when we have only the eclipſes of the ſecondaries of *Jupiter* and *Saturn* (not ſeen without great *apparatus* on land, and uſeleſs at ſea;) with the rare and vague eclipſes of the ſun and moon, and the daily eclipſe of the earth, *viz.* our *night*, occaſioned by the earth's ſhading the ſun from us; each and all inſufficient hitherto for diſcovering *the longitude at ſea.*

On theſe principles depend the reaſons of the *Georgian Kalendar.*

For if it be allowed that the ſolar revolution was originally 364 days, each 7th of which was the primitive ſabbath, why may not a regulation in conſequence thereof be admittrd for convenience in computation of our time, by reducing the year to its antient uniformity of 13 months, 4 weeks in each, and 7 days in each week, in a perpetual revolution, coinciding with the ſolar period round the ecliptic, from the firſt approach in ♈, to the return to the ſame point of the heavens? This is done by rejecting only the odd day out of the vulgar year, and ſequeſtering it for the commemoration of the *nativity* of Christ, and appropriating the *Biſſextile* every 4th year (except every 132d) for public prayers, thankſgivings, and rejoicings for national bleſſings.

The return of the ſun in his annual orbit is a natural character, and the moſt rational and commodious *epoch* for the commencement of the year; at which point *Numa*, about the 4004th year of the *Julian period* intended to fix it, when he inſtituted his regulation, and in perpetual memory thereof dedicated a temple to double *Janus*, the tutelar God of the new year. Though indeed by a retroſpect calculation from that time to this year A. D. 1752 (the 6465th of the *Julian period*) viz. 2461 Julian years, there ſeems to have happen'd ſome error, either through miſtake of the time of the mean ſolſtice made by *Numa*'s aſtronomers, or thoſe of his ſucceſſors, or through the neglect or ignorance of the prieſts; for now the ſolſtice happens on the 21ſt day before the 1ſt of *January* in the *Julian* year: whereas by calculation of the intervening years, the ſolſtice ſhould fall but on the 19th before it.

By this method of the *Georgian Kalendar* our years will keep equal pace with the ſun for 10219 years, till A. D. 11974 from A. D. 1755 O. S. without the variation of a ſingle neucthemeron; when the period expiring, it may be again renewed and perpetuated by proper proſthaphæreſes as long as the ſolar ſyſtem continues in its preſent motions and ſituations.

As to the uſes of the *Georgian Kalendar*, it exhibits a perpetual ſtated relation between the days of the weeks and months in a conſtant harmony; thus the 1ſt, 8th, 15th, and 22d days of every month are always *Sundays*, and ſo of the reſt.

The leap-day being not intercalated, but placed at the end of the year, does not diſturb calculations, as it does in the *old* and *new ſtiles*, which ſtuff it into *February*, after the old heathen manner.

The *epacts* or *primes* may be placed throughout the year, collateral to their proper days, by which the *change*, *fall*, and *age* of the moon would be indicated perpetually, by removal of the places of the primes but one ſtep every 312th and 313th year alternately: and the ſeaſons, with tables of equation of natural days, of the ſun's place, oblique and right aſcenſion, declination, &c. might be adjoined in proper columns (with ſhort rules of proſthaphæreſis for their continual regulation) all reducible to *ſynchronal* days by the ſolar numbers, or diſtances of the days of the year (in either computation) from its commencement at the firſt of ♈: and the ſame reduction in the ſame manner may be made of *Jewiſh*, *Turkiſh*, *Indian*, *Chineſe*, or any other kind of years, ſolar or lunar, antient or modern.

The 1ſt or any other day of each month might be eſteemed ſacred to the memory of one of the 12 apoſtles and St *Paul*, from whom their reſpective months might be denominated; and if more fixt holidays be requiſite, they might either be aſſigned to the ſolar days on which they are now obſerved, or where elſe it may pleaſe authority to ſettle them.

For it is to be noted, that the GREGORIAN computation is far from perfection; particularly on account of the vibration of the day of the *equinox*, for the ſpace of 5 days: ſo that *Eaſter* is ſometimes placed in a wrong month, and at other times there happen *two Eaſters* in one *eccleſiaſtical year:* likewiſe the mean full-moons being only referr'd to in the calculation by epacts, *Eaſter* is celebrated ſometimes on the day of the *Jewiſh* full-moon, and at other times a week too late. Whereas, had the *leap-years* been to be omitted every 132d year (as propoſed in the *Georgian Kalendar)* and proper allowance made for the day that the moon varies in the *metonic* cycle every 312th and 313th year alternately, *Eaſter* tables might then have been made very eaſy and regular.

But ſince that method has been diſregarded on account of commerce, &c. the tables for finding *Eaſter* and its dependents by the *centuriates*, *annates*, and *paſchates* in the *Georgian* ſcheme; though they exactly agree with the eſtabliſh'd method by the *epacts* till the year 2000, (except the few hereafter noted) for about 250 years to come; yet certain years afterwards they indicate *Eaſter* a week ſooner than the cyclical tables ſhew it: ſo that the *Endymions* of thoſe future ages (if theſe tables be uſed) muſt inſert a few directions for the paſchate numbers, unneceſſary to be noticed at this diſtance of time any more, than that the years before 2000, which give *Eaſter* in theſe tables a week ſooner than the *Gregorian* inſtitution are A. D. 1902-6-26-30-50-57-70-74-77-94 and 1997.

The fluctuating time of *Eaſter* has formerly been actually altered by authority of the *Pope*; and the ſame is now done by authority of the *Britiſh parliament*; but after all it rambles for 35 days, in different years, after the *Jewiſh moon*: ſo that the vague time being allowed alterable, would it not be more rational, and as agreeable to *chriſtian piety*, that one and *but one* alteration more ſhould be made, which is to fix it (and conſequently its dependents) permanently to certain ſtated days? If *Eaſter-day*, A. D. 325, when the *Nicene* rule was made, happen'd on the 18th of *April*, the 19th of *April* (the day after it) being the 2d *Sunday* in the 5th *Georgian* month, or the 120th day of the year from the winter ſolſtice; was *Eaſter* fix'd to that day (or rather indeed to the day of the reſurrection) all the now moveable feſtivals would fall perpetually on ſtated days: which, had it been done by the primitive *chriſtians*, would have prevented thoſe terrible diſputes, confuſions, and even bloodſhed, that have been occaſioned by an affair, indifferent in itſelf: for the day of *Eaſter* always has been, and continues vague, and is ſo difficult to find in the *Gregorian* calculation, that even Mr *Leadbetter*, in his tables of the *Roman Eaſter* (though but for one century) has miſplaced it in the years 1782-3-5-6-8-9 and 1791-2-5, in the 317th page of his *ſyſtem of aſtronomy*.

But though the preſent ſtate of Chriſtendom will hardly ly permit it throughout *Europe*, yet the *Georgian* Kalendar might be introduced in part, if not wholly amongſt us, on account of its extenſive uſes: for the ſolar numbers direct to the ſynchronal neucthemeron, both according to the *Julian* and *Gregorian* ſupputation: ſo that public correſpondence might be carried on, though *we* uſed the *Georgian Kalendar*, whilſt other countries adhered to the *Julian or Gregorian*. For the GEORGIAN is an UNIVERSAL RATIONAL INDEX, or common meaſure for all accounts of time; and, particularly, the ſolar numbers are uſeful in computation of wages, intereſt, &c. and adapted for tables of aſtronomy, navigation, and are a general ſtandard in chronology and hiſtory; and there is nothing irregular in the *Georgian* computation, but one day to be allow'd in 132 years, which may eaſily be done without trouble or confuſion.

The nominal days are indeed therein changed, yet the number of *Sundays*, with *Chriſtmas-Day*, will be retain'd, with an additional day of reſt every leap-year, except once in 132 years, which can ſcarce happen twice in the life of any perſon.

And as for the change of a *neucthemeron* from one nominal week-day to another, ſo that *Sunday* will be removed, it can hardly be proved, that the *Jewiſh* 7th day, or ſabbath of reſt, was the very 7th day in a regular *ſeries* of weeks from the date of the creation: Beſides, the *Sundays* have been altered by the Pope, and by the late *act of parliament:* For inſtance, the 17th day of *September*

1752, which of courſe ought to be a *Thurſday*, is now actually ordained to be called *Sunday*, and in like manner all the days in the new ſtile will undergo a ſimilar tranſfer. And may not a transfer be again made for a vaſtly ſuperior improvement in the regulation of our time? But if the *Georgian* computation be rejected as needleſs, yet the other five columns of the Kalendar, duly digeſted according to the *ſynchronal* days, (*ſolar Gregorian* and *Julian)* under the preſent 12 months may be of general ſervice, as well as the additional tables, which being adapted in the ſhorteſt and eaſieſt manner for common uſe, point out (with the afore-noted ſmall alterations to be made at A. D. 1902) *Eaſter Day*, with its dependants, and likewiſe the ſtated faſts, feſtivals, and terms, in any year, both in the *old* and *new ſtile for ever*, according to the rules therewith ſpecified.

In fine, 'tis not improbable but that this *ſketch* may afford ſome uſeful improveable *hints* to ſuch as may critically examine it (though only perhaps with an intent to explode it;) and if it happens to be productive of but *one* ſingle public benefit (without doing any harm) the deſign of the author will be in a great meaſure anſwered, and his trouble amply recompenſed.

H. J.

THE

THE

REASONS, RULES, AND USES

OF

OCTAVE COMPUTATION:

OR,

NATURAL ARITHMETICK.

Moſt reſpectfully inſcribed to

The Rt Hon. Earl of MACCLESFIELD.

By H. J.

The Reaſons, Rules, and Uſes of Octave Computation; or, Natural Arithmetick.

THERE being ſuppoſed nothing of more general utility in mutual concernment with mankind than a due adjuſtment of numbers, coins, meaſures, and weights (the 4 wheels of public commerce and private dealing) perhaps it may be worth while to ſcrutinize the properties of theſe ſubjects; and where the caſe admits it, to attempt and propoſe ſome regulations that may ſeem accommodated to the purpoſes, which may be rejected by thoſe that diſlike them; but perhaps may be applied and advanced to perfection by thoſe that may approve of them.

But *Firſt*, ſome reaſons muſt be offered for ſuch propoſals. Theſe are the ſurprizing defects and irregularities in the whole, and in each part of the computations now in uſe. Doth not each nation diſagree with all others in their diviſions of each ſpecies of things? Have not ſome, different diviſions even of the ſame ſpecies? Is not this ſelf-evident by bare inſpection into the tables of coins, meaſures, and weights, uſually collected in Lexicons? This renders even common arithmetic myſterious to women, youth, &c, and often troubleſome to the beſt artiſts. Is it not therefore wonderful, that there has been no rational *uniform* attempted in theſe things in each (if not between every) civilized nation; eſpecially in *Europe*, where arts and learning flouriſh, and where trade and dealing is the principal buſineſs of the individuals, in ſome reſpect or other, either at home, or abroad, or both? For would not ſuch general conſent tend to the convenience of every member of each ſociety, without interfering with the religion or politics of any?

If the ſtate of our numbers be inquired into, it appears, that in our preſent computations there occur numberleſs ſurds, incompoſite, indefinite, and incommenſurable numbers; which (perhaps) is not ſo much occaſion'd by the nature of things, as by errors and defects in human art: ſo that, tho' theſe inconveniencies cannot *all* intirely, yet *ſome* of them may, be removed, and *the reſt* may be eaſed: for the principal root of many defects in our computations is our numbering by TEN and its powers; occaſioned (as may be imagined) by the original counting by the thumbs and fingers on both hands: but a little obſervation may demonſtrate, that TEN is not the moſt ſuitable number for the occaſion. For neither TEN or any of its powers, or products, admit bipartitions down to unity, which is a great inconvenience in practical application of numbers to coins, meaſures, and weights, and makes the proportion of moſt of the parts, to the whole decad, intricate to the apprehenſion; for though the idea of 5 to 10 be clear (as it is its half) yet the proportions of all the other parts, *viz.* of 1 : 2 : 3 : 4 : 5 : 6 : 7 : 8 : 9 : 10 are ſomewhat perplexing to the mind: and the ſame for the moſt part holds in the rectangles and powers.

Again, neither 10, its half or double, have ſquare, or cube roots; all which properties the common index of number ought to have for convenience in application to ſurfaces and ſolids.

Theſe and more ſuch may be the reaſons, that though TEN was accidentally and improperly pitch'd on for the univerſal *punctum* of numbers, yet it is ſeldom or never uſed as ſuch in application to real quantities, the inconveniencies being obvious, but the remedy not ſo; therefore, through neglect of inquiring what number would be moſt ſuitable, the preſent confuſed and troubleſome jumble of denominations may be ſuppoſed to proceed; whereby even mathematicians have ſelected a number (360) for the diviſion of a circle, and another (60) for the ſubdiviſion, not adequate to the uſe intended: for though 360 has ſeveral good properties, yet neither it, or 60, are diviſible by halving down to unity, the firſt ſtopping at its 8th 45°, and the other at its 4th 15′, of which defects practical mathematicians, inſtrument-makers, and numerous other artificers, are ſenſible.

From theſe few remarks it may appear how improper the number TEN is for our purpoſe, ſo that, though abundance more might be advanced againſt it, yet it ſeems needleſs to be inſiſted on.

But ſtill it may be aſk'd, how can all or any of theſe inconveniencies be remedied?

To which it may be replied, " by a ſubſtitution of EIGHT inſtead of TEN for the *radix* of our computation. For EIGHT is free from the forementioned defects, abounding in commodious properties not to be found in any other number. For 8, its powers, and many of its products, are diviſible down to unity by halving, quartering, &c. and the proportion of its parts to the whole are ſelf-evident without perplexity of thought; for (1) is the half quarter, (2) the quarter, (3) the quarter and half quarter, (4) the half, (5) the half and half quarter; (6) is three quarters, (7) is three quarters and half quarter of 8, into which portions a *geometrical* line, ſurface or ſolid, is moſt eaſily, readily, and preciſely diviſible, and therefore to this natural method numbers ought to conform. Again, eight is a cubic number, whoſe root is 2: 4 its half is a ſquare, whoſe root is likewiſe 2: 16 its double is a ſquare number whoſe root is 4: and 64 beſides being the ſquare of 8 is likewiſe a cubic number whoſe root is 4.

So that arithmetic by octaves ſeems moſt agreeable to the nature of things, and therefore may be called

NATURAL ARITHMETICK:

in oppoſition to that now in uſe by decads, which may be eſteem'd ARTIFICIAL Arithmetick; vulgar fractions ſtill retaining their name and uſe in both, as occaſional ſupplements.

For that arithmetick is natural, and conſequently moſt proper and uſeful, which is adapted to the nature of phyſical quantities, which, in reality, are only points, roots, ſurfaces, and ſolids; whoſe regular progreſſion from a point is a line, a ſquare, and a cube. For though numbers may be involv'd into higher powers; but geometry proceeds no farther than ſolids; yet, ſolids may ſtill accompany numbers, by forming phyſical points, ſides, ſurfaces, and ſolids, of ſuperior magnitudes, whoſe regulars are phyſical points, roots, ſquares, and cubes, of ſuperior orders; every point or cube being eſteem'd an unit (for the commencement of a line of a new order) compoſed of a determinate number of particles of equal length, breadth, and thickneſs, in the form of dice; into 8 of which particles unity is regularly diviſible; ſo that each apart, and all of them put together in due manner, ſhall retain the original form of a dice, which cannot poſſibly be done with TEN, for it has neither a ſquare or cube root: whereas, the half of 8 is 4, its ſolid baſe or ſquare, the half of which (2) is the ſide of the baſe, or cube root, the half of which ſide or root is unity, or any integer of any denomination large or ſmall; from which loweſt term of unit, as we riſe in numbers by a progreſſion of units, tens, hundreds of units, and then again by units, tens, hundreds of thouſands, and ſo upwards through millions, billions, trillions, &c. likewiſe in the involution of real phyſical quantities we riſe from units the point, through roots ſquares and cubes; which cubes are phyſical points or ſolids for the commencement of ſuperior powers in the ſame regular proceſs; which being made more naturally and commodiouſly by 8 than 10, in numbers as well as application to real quantities, the natural arithmetick by octaves may probably be introduc'd by degrees in the room of the preſent arithmetick by decads, and confuſed practice of diviſion and ſubdiviſion of ſpecies, in ſeveral, if not in all caſes, in ſome countries (at leaſt) if not univerſally. For, were its preference conſider'd, and its rules render'd familiar by a little practice, it ſtands fair for admittance, ſince it may beſt ſuit the convenience of each individual member of every ſociety.

Therefore, for the encouragement of ſuch as may be inclinable to experiment NATURAL ARITHMETICK, perhaps it may not be altogether uſeleſs, in the

2*d* place, to attempt a ſketch of its principal rules of operation.

Herein then, as to NOTATION and NUMERATION, it is to be obſerved, that the figures (8) and (9) being entirely rejected, will be one great advantage in all the rules; foraſmuch as all the terms will be lower, and conſequently the more eaſily wrought. But then to diſtinguiſh this *natural* from the *artificial* arithmetick, 'tis neceſſary that ſome new terms be applied, to prevent confuſion of ideas. The moſt natural method for which purpoſe, in noting and numbering figures, ſeems to be, to apply the *Engliſh* terminations of the degrees of compariſon *er* for 8 and *eſt* for 8 × 8, or 64, adjoining *thouſed* for 8 × 8 × 8, and millets, billets &c. for millions, billions, &c. and reſtoring the term *one*; ſo that the numbers and places in *natural* may riſe in degrees of value analogous to what they do in *artificial* arithmetick. By which means, inſtead of units, tens, hundredr, thouſands, millions, billions, &c. the places or ſteps will be *ones*, *ers*, *eſts*, *thouſets*, *millets*, *billets*, &c.

Likewiſe in involution, the ſquare may be called the *power* of the root, containing 8 phyſical points, or ones, equal to 64; and the cube (512) may be called its *powereſt*. From hence is formed

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The NUMERATION TABLE.

	trillets				thouſet				billets				thouſet				millets				thouſet				ones
6	7	|	5	2	4	|	7	6	5	|	4	3	2	|	1	0	2	|	4	5	6	|	7	4	3:
er			eſt	er			eſt	er			eſt	er			eſt	er			eſt	er			eſt	er	

This is render'd eaſy by obſerving, that as in decads numbers are divided into periods or denominations of ſix ſteps, of which the higheſt three places contain the hundreds, tens, and units of thouſands of the periods diſtance from the place of units; and the other three the hundreds, tens, and ſingle units of the proper denomination of the period: ſo the ſame order is obſerved here in the value of the *eſts*, *ers*, *thouſets*, and the *eſts*, *ers*, and *ones* of the periods; which places riſe here by eights as they do by tens in artificial arithmetick. And in notation of octave parts of an integer, the places may follow the order of decimals; but in an eightfold deſcending proportion, and for diſtinction may be term'd primes, ſeconds, thirds, &c. according to their diſtance below the place of ones.

Thus, units, ers, and eſts, may be natural denominations of the places of abſolute numbers, noted in integers; but when they are applied as coefficients to determinate ſpecies, if the name of the ſpecies was terminated with theſe ends of our ſteps, or degrees of compariſon, it would convey to the mind at once both an idea of the *numbers*, and the *things* number'd. Thus, integers in money might aſcend in octaves, by the terms of caſh, caſhers, and caſheſts: weight might riſe from the integer pound, by pounders, poundeſts; or ounce, ouncers, ounceſts, &c. yard, yarders, yardeſts; foot, feeters, feeteſts; perch, perchers, percheſts; buſhel, buſhelers, buſheleſts, &c. &c.

The better to apprehend the uſe of theſe terminations in the ſquares and cubes; *one* may be conceived as a quantity in the form of a brick or ſtone equally equally equal, ſuppoſe 8 inches long, broad, and thick: then 8 of theſe ſtones, or phyſical points, join'd contiguous in a right line, will form a ſolid ſide or root, in the ſhape of a foundation; 8 of theſe ſtones long, and one wide, and 8 of theſe roots join'd like a pavement, form a ſolid ſquare of 8 × 8 = 64, or the power of 8; and 8 of theſe powers, placed on one another, form a powereſt, or cube of 512 ſtones, in the ſhape of a brick-kiln: ſuch a brick-kiln, or cube of $8\times8\times8=512$ may be again conſider'd as *one* of a new denomination; and ſo on in the higher powers and powereſts: and ſo in like manner the original ſingle *one* ſtone may be conceived ſub-divided in an eightfold proportion into the ſmalleſt particles even down to atoms.

Here, in every half period (or roots, power, and powereſt) 'tis eaſy to apprehend the proportion that any of the roots or powers bear to the aggregate of the powereſt: the advantage of which in our *natural* proportion over the *artificial* proportions now in uſe, may appear in the propoſals relating to ſuperficial and ſolid menſurations.

In 12, an higher number than 8 and 10, we have a notation ſomething ſimilar, aſcending by dozens and groces, and alſo deſcending from ſhillings to pence, and from feet to inches; but theſe being to be wrought by reduction, or croſs-multiplication, or by binomials, are cumberſome in the operation. There are indeed *ſome* inſtances of natural octaves, as the *Spaniſh* pieces of eight, ſome meaſures of capacity, and the ſeamſter's yard, the joiner's inch, and the butcher's ſtone: but then theſe are imperfect, foraſmuch as the integers and fractional parts are managed by decads, and the ſub-diviſions are generally irregular. And though merchants in the ſales of ſome commodities compute the parts of the loweſt integer by eighths, ſixteenths, &c. yet all the reſt is done by the artificial denominations. But moſt remarkably do muſicians, thoſe abſolute maſters of harmony, regard octaves.

NATURAL ADDITION and SUBTRACTION.

As notation is made by octaves, inſtead of decads, and the vulgar irregulars, ſo muſt the term of carrying and borrowing be always 8; but in all other reſpects addition and ſubtraction in *natural* differ nothing from decimal *arithmetick*; but with this vaſt preference, that in the former, numbers are ready prepared for the operations, not only of addition and ſubtraction, but alſo for multiplication, and diviſion, practice, involution, evolution, and for all other occaſions moſt commodiouſly, without the preſent great trouble of reduction, aſcending and deſcending, to or from decimals and common denominations, of which vaſt inconvenience thoſe that are but very little converſant in arithmetick muſt be ſenſible, eſpecially when they conſider, that with all their pains when the diviſor terminates with 1. 3. 7. or 9. decimal diviſion remains indeterminate.

But till ſome ſpecies of things be reduced to the natural diviſion and ſubdiviſion by octaves, it may be proper to lay down the rules of reduction of decads to octaves and *vice verſâ*. Here, for diſtinction in reduction, the converſion into natural arithmetick may be called OCTAVATION, and the reduction of octaves to decimal arithmetick may be term'd DECIMATION. And before examples of *decimation* and *octavation* be given, it is neceſſary to exhibit a table of NATURAL MULTIPLICATION, eaſy to be learnt and remember'd by ſuch as may be inclin'd to attempt operations in natural arithmetick, eſpecially thoſe that are entire novices in figures: but thoſe that are expert may readily multiply by octaves without the table, by marking in their minds the terms of 8. 16. 24. 32. 40. 48. 56. 64. riſing by 8 inſtead of 10.

A TABLE *of* NATURAL MULTIPLICATION.

$$1 \times 8 = 10 = \text{er}$$

$$2 \times \left\{ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \end{matrix} \right\} = \left\{ \begin{matrix} 2 \\ 4 \\ 6 \\ 10 = \text{er} \\ 12 = \text{er, } 2 \\ 14 = \text{er, } 4 \\ 16 = \text{er, } 6 \\ 20 = 2\text{ er} \end{matrix} \right. \qquad 3 \times \left\{ \begin{matrix} 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \end{matrix} \right\} = \left\{ \begin{matrix} 11 = \text{er, } 1 \\ 14 = \text{er, } 4 \\ 17 = \text{er, } 7 \\ 22 = 2\text{ er, } 2 \\ 25 = 2\text{ er, } 5 \\ 30 = 3\text{ er} \end{matrix} \right.$$

$$4 \times \left\{ \begin{matrix} 4 \\ 5 \\ 6 \\ 7 \\ 8 \end{matrix} \right\} = \left\{ \begin{matrix} 20 = 2\text{ er} \\ 24 = 2\text{ er, } 4 \\ 30 = 3\text{ er} \\ 34 = 3\text{ er, } 2 \\ 40 = 4\text{ er} \end{matrix} \right. \qquad 5 \times \left\{ \begin{matrix} 5 \\ 6 \\ 7 \\ 8 \end{matrix} \right\} = \left\{ \begin{matrix} 31 = 3\text{ er, } 1 \\ 36 = 3\text{ er, } 6 \\ 43 = 4\text{ er, } 3 \\ 50 = 5\text{ er} \end{matrix} \right.$$

$$6 \times \left\{ \begin{matrix} 6 \\ 7 \\ 8 \end{matrix} \right\} = \left\{ \begin{matrix} 44 = 4\text{ er, } 4 \\ 52 = 5\text{ er, } 2 \\ 60 = 6\text{ er} \end{matrix} \right. \qquad 7 \times \left\{ \begin{matrix} 7 \\ 8 \end{matrix} \right\} = \left\{ \begin{matrix} 61 = 6\text{ er, } 1 \\ 70 = 7\text{ er} \end{matrix} \right.$$

$$8 \times 8 = 100 = \text{eſt}$$

In this table for every 8 one *er* is carried to the next ſtep, and the overplus above the whole eights or *ers* is noted in the ſame manner as is done in artificial or common arithmetick, by tens: every 8 being noted 10 or er : 64 = 100 or eſt : 512 = 1000, or a thouſet.

To *octavate* (or convert to natural notation) any numbers noted by decads, the powers of 8 muſt be regarded, for as the ſteps in decads proceed by 10 : 100 : 1000 ÷ ſo in octaves they riſe by the powers of 8; which are $\overset{1}{8} : \overset{2}{64} : \overset{3}{512} : \overset{4}{4096} : \overset{5}{32768}$ ÷ Therefore, to *octavate* decads the rule is to divide them by the powers of 8 ſucceſſively, annexing the remainder (if any) or elſe [o] in the laſt place:

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Thus for examples.     8)10(=12 .       64)100(=144
                          2                 64
                                            —
                                          8)36
64)365(=555        512)999(1747             32
   320                  512                 —
   ———                  ———                  4
 8)45               64)487          ———————————————
   40                  448          512)520(1010
   —                   ———                512
    5                8) 39                ———
                        32            64)  8
                        —                  0
                         7                 —
                                       8)  8
                                           8
                                           —
  )808(=1450                               0
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Here note, that theſe operations may be done mentally, like the laſt, by perſons uſed to numbers.

To *decimate octaves:* multiply each ſtep of the octave number into the proper power of 8, and the ſum of the products (with the laſt figure, if any) gives the ſame number expreſs'd in decads. Thus, for examples;

8	64 8	64 8	512 64 8		
12	144	555	1747	1010(	1450
—	—	—	—	—	—
8	64	320	512	512	512
2	32	40	448	0	256
—	4	5	32	8	40
10	—	—	7	0	—
	100	365	—	—	808
			999	520	

Thus can integer decads be octavated, and octaves decimated readily and eaſily for operation in ſuch ſpecies as are ſubdivided by octaves, till the integers by cuſtom or authority be ſubjected (in like manner) to an octave aſcending progreſſion.

In notation of natural fractions, or any number of the parts of an integer, divided octavely into 8, 64, 512, or 4096, &c. equal parts; as in decimal fractions, the 10ths occupy the 1ſt ſtep, the hundredths the 2d, &c. ſo the ſame order obtains in octave fractions: only for diſtinction, as octave integers ought to have over them o; ſo octave fractions ought to be ſeparated from their integers by (:) inſtead of (,) the uſual ſeparatrix in decimals. Thus the decimal fractions, 0,125. 0,25. 0,375. 0,5. 0,625. 0,75. 0,875. are converted to octave expreſſions by a multiplication into 8, and a diviſion by their reſpective decimal denominators, whereby they ſeverally become in octaves, 0:1. 0:2. 0:3. 0:4. 0:5. 0:6. 0:7. thus, for inſtance in the laſt, $\frac{0,875 \times 8}{1000} = 0:7$.

Numbers thus noted octavely are not only to be added and ſubſtracted, but alſo multiplied and divided, &c. exactly like decads and decimals; only 8 muſt be the *punctum* of carrying and borrowing inſtead of 10. So that, were *ſpecies* reduced to octave or natural proportion, all the variation from the preſent vulgar and decimal arithmetick would conſiſt only in the terms of numeration and multiplication, and the value of the ſteps, which by a little practice would be rendered eaſy.

The introduction of computation of ſpecies in this natural octave proportion, above and below integers, would entirely remove the confuſed trouble of reducing and re-reducing the abſurd variety of denominations now in uſe; ſince then there would be but the ſingle proportion of natural diviſion and computation of numbers and things by halves, quarters, and half quarters; whereby the rules of practice would become far plainer and more expeditious than they now are; foraſmuch as all numbers would be ready prepared in their ſimple notations for any operation, therefore it may not be improper in the third place to propoſe ſome uſes of natural arithmetick, by pointing out methods for dividing our coin, meaſures, and weights in an octave proportion, which (it is ſuppoſed) may be done with but little innovation.

For firſt, as to our coin,

Might not this diviſion be eaſily effected by altering the proportion of ſilver to copper by $\frac{1}{16}$ and calling the preſent half-penny a penny, as it is already call'd by us in theſe plantations? Then our preſent half-crowns would contain 64 (inſtead of 60) of theſe pennies, and the pound or integer would be equal to 512 of them; and inſtead of 960 there would be eſteem'd 1024 of our farthings in a pound ſterling.

May not the vaſt quantity of copper lately found in our plantations on the continent of *North America* well allow (if not require) this alteration in the proportion of the value of ſilver to that metal? But if ſuch alteration in the value may injure any poſſeſſed of that ſpecies, either in oar or in coin; may not $\frac{1}{16}$ be deducted in the weight (ſo as to convert 15 of the preſent half-pennies into 16) whenever any copper coin is hereafter iſſued out of the mint, to introduce the change by degrees, without alteration of the value?

Then eight of theſe half-pennies (called pennies) would make a new groat (a term formerly applied to a real ſilver coin) hereupon to be minted: eight ſuch groats would make the preſent half-crown; and eight half-crowns would ſtill make an integer pound ſterling of the ſame value in proportion to copper as it now is; though divided into 1024, inſtead of 960.

Now, if the guinea was lower'd at recoinage to twenty ſhillings, and the half guinea to ten, then ſhould we have in real coin, the pound integer, or guinea; the half pound, or half guinea; the quarter of a pound, or crown; the half-quarter (or $\frac{}{8}$) the half-crown; the 64th of a pound, or the 8th of the half-crown, the new groat: the 8th of the groat, or 512th of a pound, the new penny; and the half of the new penny, the new farthing, or the 1024th part of a pound; and the preſent ſhilling would ſtill be the 20th of a pound; the ſix-pence would ſtill be the 40th, and two ſhillings and ſix-pence would ſtill be the half-crown, or 8th of a pound.

Though theſe laſt being the 5th and 10th of a crown, would it not be proper at every recoinage gradually to iſſue out in their ſtead ſilver pieces equal to the 4th and 8th of a crown? And beſides, to ſerve certain caſes, might not the *Iriſh* half-pennies paſs for $\frac{2}{3}$ and *Iriſh* farthings for $\frac{1}{3}$ of the new penny? Or elſe, might not good copper of theſe values be coined?

Then in accompts, inſtead of the denominators 20 : 12 : 4. (very unfit for practical application to the ſubdiviſion of other ſpecies) we ſhould have a natural ſeries of real coin in octaves, fitter for all purpoſes, than the preſent denominations; for as 8 new pennies would be equal to 1 groat, 8 groats would be equal to 1 half crown; and 8 half crowns would be the integer pound; ſo downwards below the penny in accompts there may be computed its 8th, 64, &c. as low as occaſion may require.

And if the integers were to riſe by the terms caſh, caſher, caſheſt, noted and numbered octavely; the parts would then uniformly deſcend by primes (or half-crowns) ſeconds (or groats) and thirds (or new pennies) &c. to be noted in their proper ſteps, below the integer pounds, ready for all operations, either as abſolute numbers, or when applied as co-efficients, not only to things bought and ſold by tale, (which are moſt eaſily reduceable to octaves) but to meaſures and weights; which alſo may naturally be thus computed by one *univerſal ſtandard* for each and every country.

This *univerſal ſtandard* (perhaps the only one in nature) is a *pendulum* vibrating between *cycloids*.

For though it is of late diſcover'd, that the moments of oſcillation of the ſame *pendulum* differ in different latitudes, the *radii* from the earth's center decreaſing from the æquator towards the poles by reaſon of the oblate form of our terraqueous globe; yet the moments of the ſame *pendulum* in different places are eaſily determined. So that from the vibration, and the length of the *pendulum* at the ſtandard latitude (ſuppoſe at the ſea ſide at *Dover* and *Calais*) the true ſtandard length may be found in any other part of the world.

Theſe places ſeem moſt commodious for all *European* ſtates, that may incline to come into one natural *uniform*, for their common convenience, as they are ſituated in the general rout of *European* navigators, and at equal diſtances from the earth's center; their difference of latitude being comparatively inſignificant, and all inveſtigations being to be made at the ſea ſide for diſcovering the length of the ſtandard *pendulum* fixt to a certain latitude.

That *pendulum* ſeems moſt apt for an univerſal ſtandard, which vibrates ſeconds, whoſe exact length (from the center of motion to the center of the oſcillating ball) being taken for the integer, may be divided and ſubdivided in an octave proportion for the primes, ſeconds, &c. of any ſpecies of meaſures:

And alſo from thence may be deduced a *ſtandard* for *weights*, if the whole or any part thereof be taken for the ſide of a cubical veſſel, and the weight of the raiſe-water (or any other ſubſtance of homogeneous ſpecific gravity) that exactly fills it, be taken for the *ſtandard* integer in weights,

But foraſmuch as there ſeems no probability that this will be ſoon (if ever) univerſally complied with; therefore it may not be impertinent to ſubjoin ſome methods, that appear eaſieſt for reduction of our preſent denominations of meaſures and weights, to an octave uniformity in their different kinds. So that

2dly, As to meaſures.

Theſe relate in the firſt place to longimetry, or meaſures of mere lengths, under which may be comprehended *chronometry*, or our meaſures of time.

Our ſmall meaſures of mere lengths are the fathom, pace, ell, yard and foot; and our long meaſures are the league, mile, furlong, and perch; ſome of which are already uſually ſubdivided by octaves, and all of them may be eaſily ſo regulated; and their integers may alſo riſe in the ſame manner by fathomers, fathomeſts, pacers, paceſts, ellers, elleſts, yarders, yardeſts, feeters, feeteſts, &c. without confuſion or detriment to any. The chief change will be in the foot, now divided into 12 inches ſubdivided by octaves: But if the foot be divided naturally into 8 (inſtead of 12) when each prime will contain exactly an inch and an half, and the ſecond will become the 64th part of a foot, equal to one and an half of the preſent ſubdiviſions of an inch, which 64th is more capable of a ſubdiviſion into 8 than the preſent 8th of an inch: So that by this method a foot is actually diviſible into 8 × 8 × 8 = 512; agreeable to which an octave ſcale may eaſily be made, more commodious than the preſent decimal or duodecimal ſcales are.

As to time, it has been obſerved (in what has been ſaid about the *Georgian Calendar*) that the ſun's annual courſe or year, may moſt commodiouſly be divided into 13 (inſtead of 12) months; but as for the diurnal revolution, or *nucthemeron*: (or 24 hours) Perhaps it might have been better to have kept to the antient manner of dividing it into 8 primes (like the *Roman* hours and watches, but of equal duration) each containing 3 hours; diviſible again into 8 ſeconds (each equal to 22,5 preſent minutes) and ſo on into thirds and fourths, whereby the indexes of clocks and watches, and equinoctial dials (on which all others depend) by continual bipartition would point out time preciſely to the 4096th part of a *nucthemeron*: which is far more regular and nearer than the preſent 1440′, and better adapted to the apprehenſion, than our ſubdiviſion of 24 hours into 86,400 ſeconds: and if more preciſion be neceſſary in calculation, the 4096 fourths might be ſubdivided into 32,768 fifths, &c.

But as computations are now eſtabliſhed, there is but little proſpect that either time or circles will be ſhifted to octaves.

Our mile of 1760 yards is already divided into 8 primes or furlongs, each 220 yards, each of which may be again ſubdivided into 8 ſeconds, (each equal to 27,5 yards) the 8 of which being but a little more than 10 feet (viz. 10,3125 feet) is ſmall enough for a meaſuring rod or wheel for miles; ſince this may be ſubdivided into 8 and 64.

Again a mile is divided into 320 perches, each perch containing 16,5 feet, divided into 25 links; which falls under the article of ſuperficial menſuration, or the meaſures of ſurfaces; which is the next thing to be conſidered.

The art of land ſurveying in *England* is eaſy and preciſe, and generally profeſſed by perſons well verſed in the theory, as well as practical parts; but in theſe plantations it is difficult and precarious; being often like a voyage made in a continual fog, by ſeamen unacquainted with the principles of navigation, where the ſeas run mountain-high.

In *England* the objects are ſeen from the ſtations, impedipediments are eaſily ſurrounded, and the *Gunter*'s whole-chain, which is uſed, is ſo contrived, that 10 chains make an acre; ſo that the contents of any tract is readily and exactly found by decimal operation.

But *here* the ſurvey muſt be taken by courſe and diſtance, often on very uneven ground, full of thick woods, buſhes, and ſwamps, &c. and beſides, the primary and ſecondary variation, the needle is often diſturbed by ſubterraneous magnetic ſubſtances. The whole chain can rarely be applied here, ſo that ſurveys are generally made by the half-chain of 50 links, which deſtroys the expediency of Mr *Gunter*'s contrivance, with thoſe that are not perfect maſters of numbers and ſuperficial geometry: ſo that *here* ſome alterations ſeem neceſſary; tho' in *England* there is only one defect, which is, that the integer (an acre) cannot poſſibly be laid out preciſely in a ſquare. But tho' the quantity be a ſurd; yet foraſmuch as an alteration of it to the next *rational* above or below 160 would occaſion confuſion, &c. therefore the acre may beſt remain as it is. But then *here* the half-chain might be much more commodiouſly divided into 100 links; and its ſquare computed as an *area* containing 4 ſquare perches: ſo that (tho' the diviſor for converting products into acres would not be 10, as with *Gunter*'s whole-chain, yet it) would be 40, a far more commodious number for integers and parts than 160 now in uſe; and the trouble of halving the number of half-chains, to note them in perches in the field-book, (which ſometimes occaſions miſtakes) by this method would be entirely avoided, and Mr *Gunter*'s contrivance rather improved, than rejected, the chain being adapted for uſe here.

Indeed it would be far better, were our perch or chain made to conſiſt of 26 feet 1,067 inch, and divided and ſub-divided by 8, and ſurveys noted in octaves, and plotted by an octave ſcale, for then every 8 of ſuch chains or new perches ſquare, would be (within an inſignificant trifle) a ſquare acre, and the contents of any platt would be found in acres and octave parts, and the operation would be in all reſpects eaſier, more expeditious, and leſs liable to errors than it is at preſent. But there being no expectation that this method will be taken *here*, unleſs natural arithmetick becomes cuſtomary; therefore no more needs be added about it at preſent.

The next thing to be conſidered, is the menſuration of ſmaller ſurfaces, ſuch as joiners and glaziers work and materials, painting, plaiſtering, paving, tiling, ſawing, &c. The common integers in theſe are a foot, a yard, or the ſquare, (of 10 feet) &c. in all which caſes, the operations would be much more expeditious and preciſe, than by croſs or binomial reduction, &c. were the reſpective integers divided and ſub-divided by 8 into primes, ſeconds, &c. and the integers computed to aſcend by feet, feeters and feeteſts; yards, yarders and yardeſts; ſquares, ſquarers and ſquareſts, in octave or natural progreſſion, both downwards and upwards. This method, its uſe and preference, is ſo evident to thoſe that are ſkilful in theſe matters, that it is unneceſſary to inſiſt further on ſuperficial meaſures.

The next thing to be conſider'd, is ſolid menſuration, both of real ſubſtances and concavities, or veſſels of capacity, the contents whereof are eſtimated in cubic inches, feet, &c. as in timber menſuration, gauging, meaſures for grain, &c. in all which caſes, it is ſelf-evident, that the dimenſions may be beſt taken with meaſures divided octavely, and the contents moſt readily found by natural arithmetick. Only it is to be noted, that the integers muſt be reſpectively different: as for inſtance, in wine and ale meaſure: the gallon in the firſt containing 231 cubic inches, to be divided into 8, 64, &c. and alſo to aſcend by galloners and galloneſts: whereas it contains 282, to deſcend and aſcend in the ſame manner; for ale and beer: and 268,8 for dry meaſure. But would it not be much better in many reſpects, were every cubic integer a perfect cubic number, viz. 8:64: or 512?

Thus were 6,457× inches (the root or ſide of 268,8 the cubic inches in a corn gallon) divided into 8 primes, 64 ſeconds, &c. and 8 of theſe ſides taken for a ſider, and 8 of them for a ſideſt, then the menſurations would be eaſy and preciſe: eſpecially if the *ſtandard* veſſels for meaſuring liquid and dry ſubſtances, were made rectangular inſtead of circular.

For how improper is it, that a cylindrical veſſel (difficult in forming, impoſſible to be made with precicion, weak in its materials, unhandy in application, &c.) ſhould be the eſtabliſh'd gauge for our liquid and dry meaſures? For inſtance, were our buſhels, half-buſhels, &c. made rectangular of plank, in the form of a cube or half-cube, would they not be ſtronger, more eaſily, and exactly made, and prov'd, and thereby prevent baſe people from buying by meaſures too large, and ſelling by meaſures too ſmall; ſince any perſon (knowing the true dimenſions) with an octave rule, and a ſquare might readily examine them? And for conveniency (excuſe the *lowneſs* of the remarks) in filling, lifting and emptying; ſtrong ears may eaſily be nailed to the ſides, and a lip may be made on one ſide by lengthening two parallels at the top, and ſhortening them at the baſe, as much as at the top they exceed the true dimenſions.

As to the heap allow'd by cuſtom in ſome towns, the dimenſions of rectangular buſhels may be more eaſily varied to contain exactly that allowance, than a cylindrical meaſure can be adjuſted to it. And further, as theſe latter can be eaſily examined, (even by ruſticks, &c.) many frauds may be prevented in the heap, ſuch for inſtance, as that of ſome maltſters, who having 2 cylindrical buſhels (each exact by the town-ſtandard) meaſure the barley that they buy with a cylindrical buſhel, which has a large baſe, thereby gaining a great deal every 3d buſhel, which is heap'd; but meaſure the malt that they ſell by an high buſhel with a leſs baſe, whereby they gain a ſecond time by cones or heaps of leſſer dimenſions.

As for larger cubic meaſures, ſuch as the tonnage of ſea-veſſels, and the like, the preference of octave meaſures and natural arithmetick, is as evident in theſe caſes, as in the foregoing.

Therefore to draw towards a concluſion:

The laſt thing to be conſider'd, is our *troy* and *averdupoiſe* weights; for *apothecaries* weights cannot be alter'd for ſeveral apparent reaſons: neither is there occaſion to alter moneyers weights, as they relate only to one ſett of gentlemen, and they but few: however 'tis preſum'd their weights would be more commodious, regular and preciſe, were their *grain* divided octavely into 32768, than by 20,24,20,24 into 23040 blanks.

The integer in *troy-weight*, is the pound which may aſcend by pounder and poundeſt, and deſcend by octaves, thro' primes, ſeconds, thirds, &c. by which means the pound would be naturally divided into 8 . 64 . 512 . 4096, or (if occaſion require) into 32768 equal parts, inſtead of the preſent irregular diviſion 12 . 240 . 5760.

But if the 100℔ be taken for the integer (as it is in ſome *ſpecies*) may not the integers aſcend by octaves, (called hundreders and hundredeſts) and the hundred be divided into 8 primes (or half-quarters) each equal to 12,5℔ and ſub-divided by 8 into ſeconds, each equal to 1,5625℔ and theſe again ſubdivided into 8 thirds, &c.?

And in fine, as to *averdupoiſe* weight: where the commodities are bought and ſold by the pound, the ſame method may be uſed as in *troy*; but if by the 112, (called the long hundred) as this is already divided into 8 primes (or half-quarters) each containing 14℔, may not this weight be naturally ſub-divided into 8 ſeconds (each equal to 1,75℔ again ſubdiviſible by octaves, as low as may be requiſite? And for diſtinction of the kind of weight, may not the whole *averdupoiſe* hundreds riſe naturally from poiſes to poiſers, and poiſeſts, by octave progreſſion aſcending, as well as deſcending by primes, ſeconds, &c.

Much more might be added on theſe ſubjects; but what is already advanced (being more than was at firſt intended, and perhaps too prolix already) ſeeming ſufficient to explain the ſcheme propoſed (in the *Gentleman*'s *Magazine* for *July* 1745, *p.* 377, and publickly demanded in the 1ſt page of the *Gentleman*'s *Magazine* for *March* 1751.) it is thought needleſs to expatiate at preſent; ſince if theſe lucubrations meet with a favourable reception, and require further illuſtration or proof; an enlargement may be communicated by the propoſer

H. J. &c.

F I N I S.

8 JY 88

BOOKS *printed for* E. CAVE *at* St JOHN'*s* GATE.

I. THE Preſent State of the BRITISH CUSTOMS. (Dedicated to the Rt Hon. *Henry Pelham*, Eſq;)

CONTAINING,

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